# Inadvertent lead malposition in the left heart during implantation of cardiac electric devices

## Supplementary Appendix

Table S1. Details of patients with acute transient ischemic attack or stroke at the time of lead malposition diagnosis.

| Study | Year of publication | Age | Sex | Device Type | TIA or Stroke | Antithrombotic therapy | Time from CIED implantation and diagnosis of ILMLH (days) | Baseline antithrombotic therapy details | Management | Details management | Follow up | Months of follow-up | Event |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Agnelli et al [1] | 2000 | 63 | Female | PMK | Stroke | Antiplatelet | 7 | | Percutaneous Extraction | | No | | |
| Aguilar et al [2] | 2002 | 35 | Female | PMK | TIA | None | 365 | | Anticoagulant | INR > 2.5 | Yes | 72 | No |
| Alan et al [3] | 2015 | 71 | Female | PMK | TIA | Unknown | 4745 | | Unknown | | No | | |
| Alozie et al [4] | 2012 | 70 | Male | ICD | TIA | Antiplatelet | 60 | | Surgical Extraction | | No | | |
| Anastacio et [5] | 2012 | 74 | Male | PMK | TIA | Anticoagulant | 913 | VKA | Percutaneous Extraction | | No | | |
| Arnar et al [6] | 2001 | 69 | Male | PMK | TIA | Antiplatelet | 180 | | Anticoagulant | VKA INR > 2.5 plus Aspirin | Yes | 84 | No |
| Arnar et al [6] | 2001 | 62 | Male | PMK | Stroke | Antiplatelet | 540 | | Surgical Extraction | | Yes | | No |
| Aslam et al [7] | 1999 | 65 | Male | PMK | Stroke | Antiplatelet | 2190 | | Anticoagulant | VKA | Yes | 8 | No |
| Bahadorani et al [8] | 2015 | 73 | Male | PMK | Stroke | Antiplatelet | 540 | | Percutaneous Extraction | Cerebral Protection | Yes | 1 | No |
| Bajaj et al [9] | 2015 | 73 | Male | PMK | Stroke | Antiplatelet | 120 | | Anticoagulant | VKA INR > 2.5 | No | | |
| Bauersfeld et al [10] | 1994 | 79 | Female | PMK | Stroke | None | 1095 | | Anticoagulant | VKA | Yes | 13 | No |
| Bohom et al [11] | 1998 | 59 | Male | PMK | Stroke | Antiplatelet | 2373 | | Surgical Extraction | | No | | No |
| Curnis et al [12] | 2011 | 76 | Male | PMK | Stroke | Unknown | 180 | | Percutaneous Extraction | | Yes | 6 | No |
| Daher et al [13] | 2006 | 86 | Female | PMK | Stroke | Unknown | 730 | | Anticoagulant | | No | | |
| Ergun et al [14] | 2004 | 61 | Male | PMK | Stroke | None | 730 | | Anticoagulant | VKA | Yes | 19 | No |
| Ghani et al [15] | 1993 | 76 | Female | PMK | Stroke | None | 1020 | | Anticoagulant | VKA | Yes | 9 | No |
| Guzman et al [16] | 2011 | 75 | Female | PMK | Stroke | None | 3280 | | Anticoagulant | VKA | No | | |
| Harrison et al [17] | 2017 | 36 | Female | ICD | TIA | None | 4745 | | Percutaneous Extraction | Cerebral Protection | No | | |
| Heck et al [18] | 2010 | 82 | Female | PMK | TIA | Anticoagulant | 1460 | VKA | Percutaneous Extraction | | No | | |
| Hinojos et al [19] | 2017 | 70 | Female | PMK | TIA | Anticoagulant | 30 | VKA | Surgical Extraction | | No | | |
| Kalavakunta et al [20] | 2014 | 77 | Male | PMK | TIA | Anticoagulant | 1080 | VKA with sub-therapeutic INR plus Aspirin | Anticoagulant | VKA INR > 2.5 | Yes | 24 | No |
| Karavelioglu et al [21] | 2016 | 73 | Male | PMK | Stroke | Antiplatelet | 690 | | Percutaneous Extraction | | No | | |
| Kutarski et al [22] | 2011 | 52 | Male | PMK | Stroke | None | 1825 | | Percutaneous Extraction | Cerebral protection | Yes | 0.25 | Stroke intra-procedure |
| Liebold et al [23] | 1994 | 56 | Female | PMK | Stroke | None | 1095 | | Surgical Extraction | | No | | |
| McManus et al [24] | 2009 | 78 | Male | PMK | Stroke | None | 60 | | Anticoagulant | VKA INR > 2.5 | No | | |
| Ohlow et al [25] | 2015 | 63 | Female | PMK | TIA | Unknown | 120 | | Percutaneous Extraction | | No | | |
| Ohlow et al [25] | 2015 | 86 | Female | PMK | TIA | Unknown | 365 | | Percutaneous Extraction | | No | | |
| Orlov et al [26] | 1999 | 27 | Male | PMK | TIA | None | 7 | | Percutaneous Extraction | | No | | |
| Orlov et al [26] | 1999 | 77 | Female | PMK | Stroke | None | 7 | | Anticoagulant | Failed Percutaneous extraction | No | | |
| Parikh et al [27] | 2011 | 63 | Female | ICD | Stroke | Unknown | 90 | | Surgical Extraction | | No | | |
| Raghavan et al [28] | 1996 | 66 | Female | PMK | TIA | None | 548 | | Surgical Extraction | | No | | |
| Rath et al [29] | 2014 | 75 | Male | PMK | Stroke | Antiplatelet | 30 | Antiplatelet plus LMWH | Percutaneous Extraction | | No | | |
| Read et al [30] | 2005 | 72 | Male | PMK | TIA | Anticoagulant | 730 | VKA with sub-therapeutic INR plus Aspirin | Surgical Extraction | | Yes | 4 | No |
| Reising et al [31] | 2007 | 80 | Male | PMK | Stroke | Anticoagulant | 120 | VKA with sub-therapeutic INR plus Aspirin | Percutaneous Extraction | | No | | |
| Rodriguez et al [32] | 2011 | 74 | Male | ICD | TIA | Unknown | 4015 | | Surgical Extraction | | Yes | 0,3 | No |
| Roos et al [33] | 2015 | 64 | Female | PMK | TIA | Unknown | 730 | | Percutaneous Extraction | | No | | |
| Roos et al [33] | 1983 | 55 | Male | PMK | TIA | Antiplatelet | 180 | | Surgical Extraction | | Yes | | No |
| Schiavone et al [34] | 1984 | 68 | Female | PMK | TIA | Antiplatelet | 548 | | Surgical Extraction | | Yes | 3 | No |
| Schon et al [35] | 2007 | 86 | Female | PMK | TIA | Antiplatelet | 4745 | | Anticoagulant | VKA INR 2-3 | Yes | 36 | No |
| Schulze et al[36] | 2005 | 82 | Male | PMK | TIA | None | 270 | | Surgical Extraction | | No | | |
| Sharifi et al [37] | 1994 | 61 | Male | PMK | TIA | Anticoagulant + Antiplatelet | 1 | | Anticoagulant | VKA INR > 2.5 | Yes | 72 | Stroke with sub-therapeutic INR |
| Sharifi et al [37] | 1994 | 83 | Female | PMK | Stroke | Antiplatelet | 1825 | | Anticoagulant | VKA INR > 2.5 | Yes | 24 | Stroke with sub-therapeutic INR |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sharifi et al [37] | 1994 | 75 | Female | PMK | Stroke | None | 270 | | Anticoagulant | | No | | |
| Sivapathasuntharam et al [38] | 2011 | 68 | Male | PMK | Stroke | None | 30 | | Surgical Extraction | | No | | |
| Teshome et al [39] | 2020 | 46 | Female | PMK | TIA | Anticoagulant | 1095 | | Percutaneous Extraction | | No | | |
| Thosani et al [40] | 2019 | 84 | Male | PMK | TIA | Anticoagulant | 1460 | | Percutaneous Extraction | Cerebral protection | No | | |
| Van Gelder et al [41] | 2000 | 75 | Female | PMK | TIA | Antiplatelet | 270 | | Surgical Extraction | | No | | |
| Winner et al [42] | 1989 | 80 | Male | PMK | Stroke | Unknown | 6 | | Percutaneous Extraction | | No | | |

Table S2. Details of patients who underwent surgical or percutaneous lead extraction.

| First Author | Year of publication | Age | Sex | Device Type | Route | Time from CIED implantation and diagnosis of ILMLH (days) | Extraction type | Details | Procedural complication | Details complication | Follow up | Months of follow-up | Event |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Agnelli et al [1] | 2000 | 63 | Female | PMK | Transvenous | 7 | Percutaneous extraction | | No | | Yes | | No |
| Al Dashti et al [43] | 2002 | 83 | Female | PMK | Transvenous | 30 | Percutaneous extraction | | No | | No | | |
| Alozie et al [4] | 2012 | 70 | Female | ICD | Transarterial | 60 | Surgical extraction | | No | | No | | |
| Anastacio et al [5] | 2012 | 74 | Male | PMK | Transvenous | 913 | Percutaneous extraction | Laser | No | | No | | |
| Arnar et al [6] | 2001 | 62 | Male | PMK | Transvenous | 540 | Surgical extraction | | No | | Yes | | No |
| Bahadorani et al [8] | 2015 | 73 | Male | PMK | Transarterial | 540 | Percutaneous extraction | Cerebral protection | No | | Yes | 1 | No |
| Barbarash et al [44] | 2016 | 63 | Male | ICD | Transarterial | 365 | Surgical extraction | | No | | Yes | 2 | No |
| Benito Martin et al [45] | 2013 | 70 | Female | PMK | Transvenous | 730 | Surgical extraction | | No | | No | | |
| Bodian et al [46] | 2013 | 56 | Female | PMK | Transvenous | 1 | Percutaneous extraction | | No | | No | | |
| Bohm et al [11] | 1998 | 59 | Male | PMK | Transvenous | 2373 | Surgical extraction | | No | | No | | |
| Bracke et al [47] | 2003 | 54 | Male | PMK | Transarterial | 180 | Percutaneous extraction | Femoral retrieval | No | | Yes | 6 | No |
| Calvagna et al [48] | 2015 | | | ICD | Transarterial | | Percutaneous extraction | | No | | No | | |
| Carrizo et al [49] | 2015 | 63 | Female | PMK | Transarterial | 90 | Percutaneous extraction | Covered stent in subclavian artery | No | | Yes | 12 | No |
| Case 2 | 2018 | 38 | Male | PMK | Transvenous | 60 | Percutaneous extraction | Manual traction | No | | Yes | 18 | No |
| Chun et al[50] | 2004 | 52 | Female | PMK | Transvenous | 1 | Percutaneous extraction | | No | | No | | |
| Contractor et al [51] | 2019 | 64 | Male | CRT | Transvenous | 180 | Percutaneous extraction | Cerebral protection | No | | Yes | 1 | No |
| Curnis et al [12] | 2011 | 76 | Male | PMK | Transvenous | 180 | Percutaneous extraction | | No | | Yes | 6 | No |
| De Cock et al [52] | 2003 | 74 | Female | PMK | Transvenous | 180 | Percutaneous extraction | | No | | No | | |
| Deshmukh et al [53] | 2014 | 75 | Male | PMK | Transvenous | 330 | Percutaneous extraction | | No | | No | | |
| Di Tommaso et al [54] | 2013 | 74 | Female | PMK | Transarterial | 2 | Percutaneous extraction | Stent graft in the aortic arch | No | | Yes | 12 | No |
| Dissman et al [55] | 2013 | 75 | Male | CRT | Transvenous | 30 | Percutaneous extraction | | No | | No | | |
| Ergun et al [14] | 2004 | 61 | Male | PMK | Transvenous | 730 | Percutaneous extraction | | No | | Yes | 19 | No |
| Ergun et al [14] | 2005 | 63 | Male | PMK | Transvenous | 1 | Surgical extraction | CABG | No | | No | | |
| Estrada Quintero et al [56] | 1995 | 76 | Female | PMK | Transvenous | 1 | Percutaneous extraction | | No | | No | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Garg et al [57] | 2013 | 50 | Female | PMK | Transarterial | 1 | Percutaneous extraction | Temporary pacing | No | | No | | |
| Gondi et al [58] | 1981 | 58 | Female | PMK | Transvenous | 0.2 | Percutaneous extraction | Temporary pacing | No | | No | | |
| Gupta et al [59] | 2010 | 74 | Female | PMK | Transvenous | 0.2 | Percutaneous extraction | Temporary pacing | No | | No | | |
| Harrison et al [17] | 2017 | 36 | Female | PMK | Transvenous | 4745 | Percutaneous extraction | Cerebral protection; Laser | Yes | Respiratory tract infection | No | | |
| Heck et al [18] | 2010 | 82 | Female | PMK | Transvenous | 1460 | Percutaneous extraction | | No | | No | | |
| Hinojos et al [19] | 2017 | 70 | Female | PMK | Transarterial | 30 | Surgical extraction | Epicardial PMK | No | | Yes | | No |
| Iliceto et al [60] | 1982 | 78 | Female | PMK | Transvenous | 1 | Percutaneous extraction | | No | | No | | |
| Irvine et al [61] | 2011 | 81 | Female | PMK | Transarterial | 14 | Surgical extraction | | No | | No | | |
| Judson et al [62] | 1981 | 40 | Male | PMK | Transvenous | 2920 | Surgical extraction | CABG | No | | No | | |
| Karavelioglu et al [21] | 2016 | 73 | Male | PMK | Transvenous | 690 | Percutaneous extraction | | No | | No | | |
| Kosmidou et al [63] | 2012 | 79 | Male | PMK | Transarterial | 180 | Percutaneous extraction | Cerebral protection; Covered stent | No | | No | | |
| Kosmidou et al [63] | 2012 | 63 | Male | ICD | Transarterial | 365 | Percutaneous extraction | Cerebral protection; Covered stent | No | | No | | |
| Kumar Sinha et al [64] | 2015 | 69 | Male | PMK | Transvenous | 1 | Percutaneous extraction | | No | | Yes | | No |
| Kutarski et al [22] | 2011 | 52 | Male | PMK | Transvenous | 1825 | Percutaneous extraction | Cerebral protection | Yes | Stroke peri-procedure | Yes | 0.25 | Stroke |
| Letek et al [65] | 2016 | 74 | Male | PMK | Transvenous | 1 | Percutaneous extraction | | No | | No | | |
| Liebold et al [23] | 1994 | 56 | Female | PMK | Transarterial | 1095 | Surgical extraction | Epicardial PMK | No | | Yes | 0.25 | No |
| Lin et al [66] | 2017 | 82 | Female | PMK | Transvenous | 1 | Surgical extraction | Perforation repair | No | | Yes | 0.5 | No |
| Ling et al [67] | 2013 | 61 | Male | PMK | Transvenous | 2190 | Surgical extraction | Epicardial PMK; Aortic root surgery | No | | No | | |
| Mazzetti et al [68] | 1990 | 64 | Male | PMK | Transarterial | 14 | Percutaneous extraction | | No | | Yes | 7 | No |
| Miniard et al [69] | 2001 | 65 | Male | PMK | Transvenous | 300 | Percutaneous extraction | | No | | No | | |
| Ninot et al [70] | 2003 | 80 | Female | PMK | Transvenous | 1 | Percutaneous extraction | | No | | No | | |
| Ohlow et al [25] | 2015 | 63 | Female | PMK | Transarterial | 120 | Percutaneous extraction | | No | | No | | |
| Ohlow et al [25] | 2015 | 86 | Female | PMK | Transvenous | 365 | Percutaneous extraction | | No | | No | | |
| Ohlow et al [25] | 2015 | 63 | Male | PMK | Transvenous | 0.1 | Percutaneous extraction | | No | | No | | |
| Ohlow et al [25] | 2015 | 70 | Female | PMK | Transvenous | 1 | Percutaneous extraction | | No | | No | | |
| Ohlow et al [25] | 2015 | 77 | Male | PMK | Transvenous | 1 | Percutaneous extraction | | No | | No | | |
| Ohlow et al [25] | 2015 | 70 | Male | PMK | Transvenous | 1 | Percutaneous extraction | | No | | No | | |
| Orlov et al [26] | 1999 | 27 | Male | PMK | Transvenous | 7 | Percutaneous extraction | | No | | No | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Overbeck et al [71] | 2005 | 72 | Female | PMK | Transarterial | 30 | Surgical extraction | CABG | No | | No | | |
| Parikh et al [27] | 2011 | 63 | Female | ICD | Transvenous | 90 | Surgical extraction | | No | | No | | |
| Pollock et al [72] | 2016 | 94 | Male | PMK | Transvenous | 480 | Percutaneous extraction | | No | | Yes | 0.5 | No |
| Raghavan et al [28] | 1996 | 66 | Female | PMK | Transvenous | 548 | Surgical extraction | ASD closure | No | | No | | |
| Rath et al [29] | 2014 | 75 | Male | PMK | Transvenous | 30 | Percutaneous extraction | | No | | No | | |
| Read et al [30] | 2005 | 72 | Male | PMK | Transvenous | 730 | Surgical extraction | | No | | Yes | 4 | No |
| Reising et al [31] | 2007 | 80 | Male | PMK | Transarterial | 120 | Percutaneous extraction | | No | | Yes | | No |
| Rodriguez et al [32] | 2011 | 74 | Male | ICD | Transvenous | 4015 | Surgical extraction | Mitral valve repair; ASD closure | No | | Yes | 0.3 | No |
| Rodriguez et al [32] | 2011 | 64 | Female | CRT | Transvenous | 11315 | Surgical extraction | Mitral and tricuspid valve repair; ASD closure | Yes | | Yes | 1 | Death (sepsis) |
| Rodriguez et al [32] | 2011 | 74 | Male | ICD | Transvenous | 2555 | Surgical extraction | Mitral valve replacement; ASD closure; CABG | No | | Yes | 1 | No |
| Rodriguez et al [32] | 2011 | 66 | Male | PMK | Transvenous | 30 | Percutaneous extraction | | No | | Yes | 3 | No |
| Rodriguez et al [32] | 2011 | 78 | Male | PMK | Transvenous | 60 | Percutaneous extraction | | No | | Yes | 6 | No |
| Rodriguez et al [32] | 2011 | 55 | Female | PMK | Transvenous | 2190 | Surgical extraction | | No | | Yes | 0.25 | No |
| Roos et al [33] | 2015 | 64 | Female | PMK | Transvenous | 730 | Percutaneous extraction | | No | | No | | |
| Ross et al [73] | 1983 | 55 | Male | PMK | Transvenous | 180 | Surgical extraction | Epicardial PMK | No | | Yes | | No |
| Rovera et al [74] | 2019 | 68 | Female | PMK | Transvenous | 90 | Percutaneous extraction | | No | | Yes | 3 | No |
| Ruhela et al [75] | 2014 | 65 | Male | PMK | Transvenous | 1 | Percutaneous extraction | | No | | No | | |
| Sahin et al [76] | 2008 | 54 | Female | PMK | Transvenous | 3285 | Surgical extraction | PFO closure | No | | No | | |
| Santarpia et al [77] | 2018 | 65 | Male | ICD | Transvenous | 60 | Percutaneous extraction | | No | | Yes | 1 | No |
| Sarubbi et al [78] | 2018 | 8 | Female | PMK | Transvenous | 2555 | Surgical extraction | Mitral valve repair | No | | Yes | 140 | No |
| Schiavone et al [34] | 1984 | 68 | Female | PMK | Transvenous | 548 | Surgical extraction | Epicardial PMK | No | | Yes | 3 | No |
| Schmiady et al [79] | 2019 | 80 | Female | PMK | Transarterial | 1 | Surgical extraction | | No | | No | | |
| Schulze et al [36] | 2005 | 82 | Male | PMK | Transarterial | 270 | Surgical extraction | Aortic valve replacement | No | | No | | |
| Seki et al [80] | 2009 | 70 | Female | PMK | Transvenous | 1825 | Surgical extraction | Mitral valve repair; ASD closure; epicardial PMK | No | | No | | |
| Sheetala et al [81] | 2011 | 81 | Female | PMK | Transvenous | 0.2 | Percutaneous extraction | | No | | No | | |
| Sivapathasuntharam et al [38] | 2011 | 68 | Male | PMK | Transarterial | 30 | Surgical extraction | | No | | No | | |
| Spilttgerber et al [82] | 1993 | 51 | Male | ICD | Transvenous | 14 | Surgical extraction | PFO closure | No | | No | | |
| Stillman et al [83] | 1969 | 64 | Male | PMK | Transvenous | 0.2 | Percutaneous extraction | | No | | No | | |

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|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Stouffer et al [84] | 2009 | 32 | Female | PMK | Transvenous | 5475 | Surgical extraction | PFO closure | No | | Yes | 0.2 | No |
| Syed et al [85] | 2012 | 89 | Female | PMK | Transvenous | 60 | Percutaneous extraction | | No | | No | | |
| Teshome et al [39] | 2020 | 46 | Female | PMK | Transvenous | 1095 | Percutaneous extraction | Laser | No | | No | | |
| Thosani et al [40] | 2019 | 84 | Male | PMK | Transarterial | 1460 | Percutaneous extraction | Cerebral protection | No | | No | | |
| Tobin et al [86] | 1983 | 83 | Female | PMK | Transvenous | 0.2 | Percutaneous extraction | | No | | No | | |
| Trohman et al [87] | 1991 | 62 | Female | PMK | Transvenous | 300 | Percutaneous extraction | | No | | No | | |
| Van Gelder et al [41] | 2000 | 75 | Female | PMK | Transvenous | 270 | Surgical extraction | ASD closure; epicardial PMK | No | | No | | |
| Velankar et al [88] | 2014 | 77 | Male | PMK | Transarterial | | Percutaneous extraction | | No | | No | | |
| Velibey et al [89] | 2018 | 65 | Female | PMK | Transvenous | 0.01 | Percutaneous extraction | | No | | No | | |
| Winner et al [42] | 1989 | 70 | Female | PMK | Transarterial | 5 | Percutaneous extraction | | Yes | Subclavian artery occlusion | No | | |
| Winner et al [42] | 1989 | 80 | Male | PMK | Transarterial | 6 | Percutaneous extraction | | Yes | Subclavian artery occlusion | No | | |
| Wynn et al [90] | 2013 | 81 | Mlale | PMK | Transvenous | 30 | Percutaneous extraction | | No | | Yes | | No |
| Zabek et al [91] | 2013 | 90 | Female | PMK | Transarterial | 42 | Percutaneous extraction | | No | | Yes | | No |

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